WHAT IS CLAIMED:

1. A microwave window for transmitting microwave radiation comprising:

a solid body, the solid body including a first surface and a second surface spaced apart from each other in a first direction thereby defining a thickness of said solid body in said first direction;

a flange disposed at a periphery of said solid body such that a peripheral portion of the solid body extends a length into said flange in a second direction perpendicular to said first direction,

wherein said thickness and said length are selected such that the power of reflections of microwave radiation by said microwave window are no more than about ten times the power of reflections at the minimum value.

2. A microwave window as recited in claim 1, wherein said thickness is equal to n $\lambda/2$, where n is an integer number and λ is a wavelength of the microwave radiation.

3. A microwave window as recited in claim 1, wherein said length is equal to m $\lambda/2$, where m is an integer number and λ is a wavelength of the microwave radiation.

4. A microwave window as recited in claim 1, wherein said flange is adapted to mount said solid body onto a structure.

5. A microwave window as recited in claim 4, wherein said structure is a wall of a microwave waveguide.

6. A microwave window as recited in claim 4, wherein said structure is a wall of a process chamber.

7. A microwave window as recited in claim 1, wherein said solid body comprises a dielectric material.

8. A microwave window as recited in claim 7, wherein said dielectric material is selected from one or both of the group consisting of alumina and aluminum nitride.

9. A microwave window as recited in claim 1, wherein said solid body comprises quartz.

10. A microwave window as recited in claim 1, wherein said solid body comprises silicon nitride.

11. A microwave window as recited in claim 1, wherein said solid body comprises a fluoropolymer.

12. A microwave window as recited in claim 1, wherein said solid body isolates parts of said microwave window held at different pressures.

13. A microwave window as recited in claim 1, wherein said solid body is substantially transparent at the wavelength λ of the microwave radiation.

14. A microwave window as recited in claim 1, wherein said first direction is a direction of propagation of said microwave radiation.

15. A microwave window as recited in claim 1, wherein said peripheral portion of said solid body extending into said flange is surrounded by a cavity defined at least in part by said flange.

16. A microwave window as recited in claim 15, wherein said cavity has a first dimension in the first direction and a second dimension in the second direction.

17. A microwave window as recited in claim 16, wherein said first dimension and said second dimension are selected such that reflections of microwave radiation traversing said solid body are substantially minimized.

18. A microwave window as recited in claim 17, wherein said first dimension is equal to n $\lambda/2$ and said second dimension is equal to m $\lambda/2$, where n and m are integer numbers and λ is the wavelength of the microwave radiation.

19. A microwave window as recited in claim 1, wherein said flange comprises a fluid cavity.

20. A microwave window as recited in claim 19, wherein said fluid cavity includes an inlet and an outlet.

21. A microwave window as recited in claim 20, wherein a fluid is input through said inlet and exits through said outlet.

22. A microwave window as recited in claim 21, wherein said fluid maintains said solid body in a desired range of temperatures.

23. A microwave window as recited in claim 4, wherein said flange mounts a microwave waveguide onto said structure.

24. A microwave window as recited in claim 23, wherein said waveguide is integrally formed with said flange.

25. A microwave window as recited in claim 4, further comprising one or more attachment devices to secure said flange to said structure.

26. A microwave window as recited in claim 25, wherein said attachment devices are bolts or screws.

27. A microwave window as recited in claim 25, wherein said attachment device is a clamp ring.

28. A microwave window as recited in claim 4, wherein said flange comprises a first seal member configured to seal said solid body to said structure and a second seal member configured to seal said solid body to said flange.

29. A microwave window as recited in claim 28, wherein at least one of said first seal member and said second seal member is an O-ring.

30. A microwave window as recited in claim 28, wherein at least one of said first seal member and said second seal member is a flat gasket.

31. A microwave window as recited in claim 1, wherein said solid body has a circular cross-section.

32. A microwave window as recited in claim 1, wherein said solid body has a polygonal cross-section.

33. A microwave window as recited in claim 1, wherein the power of the reflections of microwave radiation by said microwave window are not more than about five times the power of reflections at the minimum value.

34. A microwave window as recited in claim 1, wherein the power of the reflections of microwave radiation by said microwave window are not more than about double the power of reflections at the minimum value.

35. A microwave window for transmitting microwave radiation comprising:

a solid body, the solid body including a first surface and a second surface spaced apart from each other in a first direction thereby defining a thickness of said solid body in said first direction;

a flange disposed at a periphery of said solid body such that a peripheral portion of the solid body extends a first length into said flange in a first direction and extends a second length in a second direction perpendicular to said first direction,

wherein said first length, said second length and said thickness are selected such that the power of reflections of microwave radiation by said microwave window are no more than about ten times the power of reflections at the minimum value.

36. A microwave window as recited in claim 35, wherein said flange is adapted to mount said solid body onto a wall of a process chamber.

37. A microwave window as recited in claim 36, wherein said process chamber is configured to house a plasma.

38. A microwave window as recited in claim 37, wherein said first length and said second length are equal to an integer multiple of half of a wavelength of the microwave radiation and said thickness is selected such that microwave reflection from said window is minimized in the presence of said plasma.

39. A microwave window as recited in claim 35, wherein the power of the reflections of microwave radiation by said microwave window are not more than about five times the power of reflections at the minimum value.

40. A microwave window as recited in claim 35, wherein the power of the reflections of microwave radiation by said microwave window are not more than about double the power of reflections at the minimum value.

41. A plasma reactor comprising:

a process chamber adapted to house a plasma; and

a microwave window assembly mounted on said process chamber, said microwave window comprising:

a solid body, the solid body including a first surface and a second surface spaced apart from each other in a first direction thereby defining a thickness of said solid body in said first direction;

a flange disposed at a periphery of said solid body such that a peripheral portion of the solid body extends a first length into said flange in a first direction and extends a second length in a second direction perpendicular to said first direction, said flange being adapted to mount said solid body onto a wall of said process chamber,

wherein said first length, said second length and said thickness are selected such that the power of reflections of microwave radiation by said microwave window are no more than about ten times the power of reflections at the minimum value.

42. A plasma reactor as recited in claim 41, wherein said first length and said second length are equal to an integer multiple of half of a wavelength of the microwave radiation and said thickness is selected such that microwave reflection from said window is minimized in the presence of said plasma.

43. A plasma reactor as recited in claim 41, wherein the power of the reflections of microwave radiation by said microwave window are not more than about five times the power of reflections at the minimum value.

44. A plasma reactor as recited in claim 41, wherein the power of the reflections of microwave radiation by said microwave window are not more than about double the power of reflections at the minimum value.

45. A method for optimizing dimensions of a window for minimizing reflections of microwave radiation by the window, the window comprising: a solid body, the solid body including a first surface and a second surface spaced apart from each other in a first direction thereby defining a thickness of said solid body in said first direction; a flange disposed at a periphery of said solid body such that a peripheral portion of the solid body extends a first length into said flange in a first direction and extends a second length in a second

direction perpendicular to said first direction, said window being mounted on a wall of a chamber housing a plasma,

the method comprising:

running microwave simulations of microwave radiation transmission at various thicknesses of the solid body in the first direction, by taking into account absorption effects of the plasma; and

determining the thickness of said solid body at which the power of reflections of the microwave radiation at a desired microwave frequency, are no more than about ten times the power of reflections at the minimum value.

46. A method for optimizing dimensions as recited in claim 45, wherein the power of the reflections of microwave radiation by said microwave window are not more than about five times the power of reflections at the minimum value.

47. A method for optimizing dimensions as recited in claim 45, wherein the power of the reflections of microwave radiation by said microwave window are not more than about double the power of reflections at the minimum value.